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DISCUSSES HARD METALS AND SOLDERS IN MACHINE-TOOL INDUSTRY

DEVELOP STRONGER-THAN-STEEL SOLDER -- Leningradskaya Pravda, No 94, 20 Apr 50

To answer the need for a cutting tool harder than the material which it cuts a high-speed steel containing a large amount of wolfram was developed.

Wolfram is rare and expensive; therefore, the entire tool is seldom made from high-speed steel. Usually, only the cutting edge is made from this material and soldered to the holder. This method is not always reliable since the tool frequently breaks at the point of solder. The expensive steel and wolfram then go to waste.

Engineers A. P. Golovachev, N. I. Petropavlovskiy, and M. A. Fominskiy developed a solder which would permit the manufacture of sectional tools in a large variety of profiles, which however, would be monolithic and durable. They named it "GPF" after the initials of their last names. Upon testing, this solder proved very durable. Whereas, tools made with ordinary solder lasted about 1½ hours, the new cutter lasted 18 shifts and according to the records, could last longer.

This invention was made before the war. The engineers sent a claim to the ministry and waited for their inventors' certificates. They expected this innovation to become widespread among tool makers. However, the claim was shelved somewhere and the new method was not extensively introduced.

As machines became more powerful, efforts were made to build them of more durable materials. Cast iron and iron gave way to chrome, wolfram, and molybdenum steels. New, more durable tools had to be found for machining these alloy materials. This brought about the development of hard alloys, including pobedit, the hardest of them all. Then the solder had to be changed to make it suitable for hard alloys.

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After this, the cast tool appeared. Here, too, the new solder assumed exceptional importance. The manufacture of sectional disk mills, instead of whole-cast, with the shank made from ordinary machine steel became possible. New demands for durable tools arose with the introduction of high-speed metalworking. The solder made possible the fulfilling of these demands.

Invention Not Accepted

Years went on and still the new invention was not widely applied until the engineers themselves went into the plants to introduce their invention. Their work resulted in huge savings of high-speed steel.

They soon realized that it would take more than their lifetime to introduce the new method in individual plants. Therefore, Golovachev and Fominskiy went to work at the Leningrad division of the Orgtyazhmash Institute; Petropavlovskiy had left them earlier for other work. They thought that their advanced methods and ideas would receive support at the Orgtyazhmash, but their expectations were not fully realized. It is true, they were sent to various plants, but this was done in a haphazard manner.

The introduction of the new method at the Plant imeni Stalin effected a huge saving. This, it would seem, might have inspired its dissemination at all tools shops in Leningrad plants as quickly as possible. A special laboratory should have been set up at the institute where people could come to study the new technology and take back the knowledge acquired to their respective plants.

It is opportune to mention that now, after many long years, inventors' certificates have at last started to pour in to the inventors for various types of solder and for various designs of sectional tools.

Institute Director Criticized

However, Sokolov, director of the institute, continued to disregard the instructions of the Ministry of Heavy Machine Building to promote dissemination of the new method. Worse than that, situations were created at the institute which made the work of the inventors impossible and they had only one desire left -- to escape from it as quickly as possible.

Only Golovachev succeeded. Fominskiy, although he remained without any definite assignment for 5 months, would not be released by Sokolov.

Having heard about the new designs of sectional tools, the management of the Automobile Plant imeni Stalin invited Fominskiy to introduce these designs at their plant. Fominskiy was happy to go to Moscow. However, his joy was short-lived, for on that same day Sokolov called him back to Leningrad. Fominskiy thought that at last there was important work for him to do. There was nothing. Fominskiy is oppressed by the thought that through the mere caprice of Sokolov, his usefulness has been nullified. However, in the evening he continues his research with Golovachev.

The inventors have conceived another idea which opens new perspectives. It will make possible the manufacture not only of sectional tools but also complex-shaped, built-up parts for precision machines, instruments, and apparatus. The engineers have already produced such parts. These have been tested for shock, fracture and breaking-off and have withstood all the tests. The solder was stronger than the steel. The parts broke but not at the point of fusion. The solder has the remarkable diffusive property of permeating the steel. In an attempt to break the solder, pieces of steel were torn from the parts as if it were made of clay but the solder itself did not give.

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Engineers have the right to expect favorable conditions for their creative work, preferably, beyond the walls of the institute where courageous research can be conducted and new ideas and progress will be supported. Conservatives must not be allowed to pass judgment on something new which demands not only a great deal of consideration but also the ability to look into the future.

The future shows that the use of built-up parts for machines will not only save costly steel but opens a field for new designs which are based on the strength of diffusion and imply a reconsideration of present views concerning safety factors and the weight of machine tools and machines.

USE ELECTRIC SPARK-PLATING OF TOOLS WITH HARD ALLOY -- Gudok, No 50, 26 Apr 50

Every year, transport alone suffers losses of 25-30 million rubles from corrosion of steel and cast iron parts. In industry, parts made of chrome, chrome-nickel, chrome-silicon, and other heat-resistant alloys have been used extensively. However, such alloys are 10-15 times more expensive than ordinary carbon steel and Soviet industry frequently uses the less expensive materials. Transport-machine building plants have shown in practice that it is possible to increase the resistance to corrosion and wear of many locomotive parts, such as domes and tubes of steam super-heater elements, fire grates, boiler water tubes, etc., without recourse to expensive heat-resistant alloys. This is done with the aid of thermochemical processes which involve the superficial impregnation of steel and cast-iron parts with various elements.

Among these processes are cementation of steel, cyaniding, nitriding, calorizing, chrome-plating, etc. In addition, the plants are using new methods for hardening parts such as high-frequency currents, cold hardening, and electric-spark plating of cutting-tool edges with hard alloy.

Although cementation is an imperfect and outmoded method, it is still being used in railroad transport. More advanced methods are not employed. Before the war, the Proletarsk Locomotive Repair Plant chrome-plated bushings and pins for the side rod and rocker mechanisms, slideblocks, and other parts; this method has been forgotten.

Parts for new locomotives, the surfaces of which have been impregnated with various elements, have an increased resistance to wear. However, if these parts get out of order, they are replaced at the depots and repair plants by other parts made from ordinary steel which has little resistance to wear at high temperatures.

Gears for mechanical equipment, tools made of high-speed steel, and some other parts undergo cyaniding. The resistance to wear of these parts is 100-200 percent greater than that of parts made by the usual method. However, cyaniding is not being introduced in transport enterprises such as depots, repair plants, etc.

Experiments at the Kolomna Locomotive-Building Plant showed that if the concentration of salts for the cyanide process are chosen correctly, the cyanided layer reaches 2 millimeters. This layer will withstand heavy pressures.

Instead of cyaniding in molten salts, cyaniding in a gas medium, called nitriding or nitrocementation, has begun to be used in the industry's plants. Nitriding can be used very successfully in processing gears for electric locomotives. These gears usually get out of order quickly and reduce the run of locomotives between repairs. Nitriding will increase their length of service by 100-200 percent.

According to experimental plant data, calorizing, another form of case hardening, increased the hardness of steel having a 0.13 percent carbon content 400 percent. Calorization with the aid of electric metallization can be used successfully in locomotive repair and railroad-car repair plants.

Chrome-plating is one of the advanced methods for increasing wear resistance of parts. It protects the friction surfaces of a part or tool from wear and prevents corrosion. In hardness, chrome is exceeded only by corundum and diamond. Parts covered with hard chrome are 700-900 percent more resistant to wear then those not covered with it.

Slightly worn parts can also be restored by chrome plating. Tools also can be reconditioned by a layer of chrome. A series of tests on plating locomotive slide valve rings with porous chrome were recently conducted at transport machine building plants. Such rings proved to be 300-400 percent more more wear resistant than ordinary rings.

The above-described processes, if introduced into production at locomotive and railroad-car repair plants, would effect considerable savings. The length of service of locomotive and railroad-car parts would be increased and, consequently, favorable conditions for the acceleration of freight car turnaround time and locomotive turnaround time would be created.

It is intolerable that railroad transport stands apart from the technical innovations used in industry.

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